Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Turbulence Spectra in High Reynolds Number Pipe Flow[1] BRIAN ROSENBERG, MARCUS HULTMARK, MARGIT VALLIKIVI, ALEXANDER SMITS, Princeton University — Streamwise velocity spectra are acquired in fully-developed turbulent pipe flow over two decades of Reynolds number. Highly-resolved measurements are made possible by using a nano-scale thermal anemometry probe. We address the existence and nature of the classical k^{-1} and $k^{-5/3}$ spectral regions as well as the behavior of the very-large-scale motions (VLSM). The wall-normal variation of the VLSM spectral peak suggests that these motions originate at the boundary and grow with increasing wall distance, which stands in contrast to the outer-scaling behavior of boundary layer superstructures. This mechanism implies that in pipe flows outer- and inner- layer motions do not interact significantly, which was first seen in the behavior of the turbulence intensity.

[1]Supported under NR Grant N00014-09-1-0263 and NSF Grant CBET-1064257.

Brian Rosenberg
Princeton University

Date submitted: 02 Aug 2011 Electronic form version 1.4